

Results from the STAR cosmic data

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During summer and december 1999, cosmic data were taken with the STAR detector at BNL. These data were utilized to study the performance of the TPC and the read-out electronics.

The hit-level specific energy loss (dq/dx) was studied using tracks in the momentum range $1 < p < 2$ GeV/c. Systematics over pad-row (a few percent) were found in dq/dx ; they vary sector-by-sector. The systematics may be related to the fact that not all the sense wires were properly terminated by electronics. In addition, a drift distance dependence (a few percent) was found in dq/dx for the summer data; it was qualitatively consistent with diffusion of electrons drifting in the TPC gas. No dependence was evident for the december run.

The specific energy of a track (dE/dx) was obtained by a “truncated mean” method. In this analysis, 30% of the hits on the Landau tail of dq/dx were truncated. The dE/dx resolution is constant in the momentum range $p > 0.7$ GeV/c. The resolution decreases with increasing number of hits as expected. See Table 1.

nDedxHits	mean	Resolution	$\langle nHits \rangle$
5–9	6.2	19%	8.6
10–17	13.2	14%	18.5
18–27	22.5	9.1%	31.7
28–32	30.3	7.1%	42.8

Table 1: dE/dx resolution from december data

Cosmics going through the TPC central region were reconstructed as two separate but correlated tracks. Correlated tracks having at least 30 hits (out of a maximum of 45) were used to study the momentum resolution. See Table 2. This analysis was done with the summer data.

p_t [GeV/c]	$\Delta p_t/p_t$	χ^2	Expected
0.5 – 1.0	5.0%	0.96	3%
1.0 – 1.5	7.7%	1.1	4%
1.5 – 2	8.8.0%	0.96	5%
2.0 – 2.5	17%	0.6	6%

Table 2: p_t resolution from summer data.

The resolutions are greater than the expected ones because of digital corruption in the read-out electronics and because the diffusion is not corrected for. The analysis of the cleaner december data is in progress.

The residuals as a function of the crossing angle are shown in Figure 1. The xy-residual for

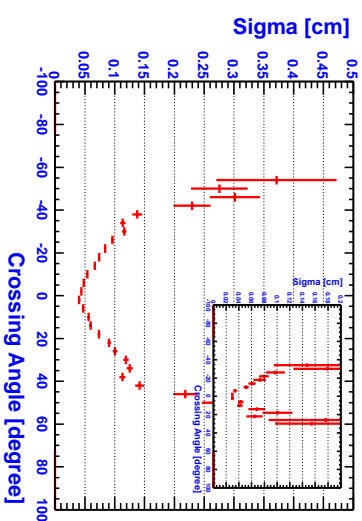


Figure 1: xy-residuals as a function of the crossing angle

zero crossing angle and integrated over the full drift length is 400 μm . The inset shows a blow-up of the residual distribution for 50 cm drift, here the xy-residual for zero crossing angle is 250 μm . This value is close to the maximal achievable value of 200 μm .